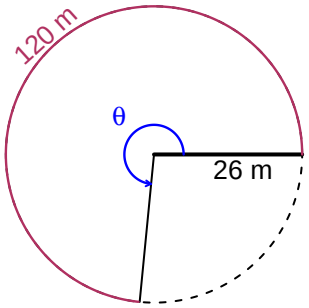
Name: Date:

Trig Final (SLTN v653)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 26 meters. The arc length is 120 meters. What is the angle measure in radians?

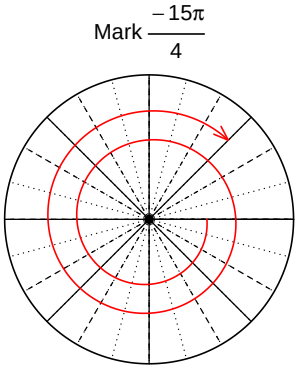


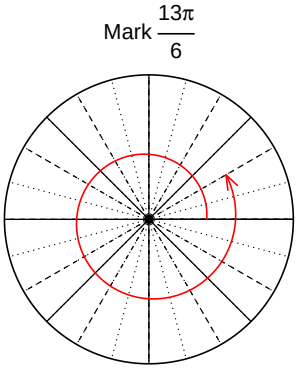
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.615$ radians.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).





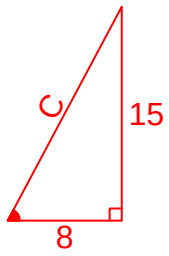
$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{-15}{8}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

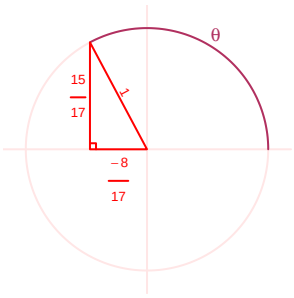
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + 15^2 = C^2$$
$$C = \sqrt{8^2 + 15^2}$$
$$C = 17$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-8}{17}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.99 Hz, an amplitude of 5.04 meters, and a midline at $y = -8.41$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.04\cos(2\pi 6.99t) - 8.41$$

or

$$y = -5.04\cos(13.98\pi t) - 8.41$$

or

$$y = -5.04\cos(43.92t) - 8.41$$